RED SEAL

THE INTERPROVINCIAL STANDARDS RED SEAL PROGRAM

National Occupational Analysis

2012 | Metal Fabricator (Fitter)

Human Resources and Skills Development Canada
Ressources humaines et Développement des compétences Canada
Canada

National Occupational Analysis

Metal Fabricator (Fitter)

2012

Trades and Apprenticeship Division	Division des métiers et de l'apprentissage
Labour Market Integration Directorate	Direction de l'intégration au marché du travail
National Occupational Classification:	7235
Disponible en français sous le titre :	Monteur-ajusteur/monteuse-ajusteuse de charpentes métalliques

This publication can be downloaded online at: www.red-seal.ca.

This document is available on demand in alternative formats (Large Print, Braille, Audio Cassette, Audio CD, e-Text Diskette, e-Text CD, or DAISY), by contacting 1 800 O-Canada (1 800 622-6232). If you have a hearing or speech impairment and use a teletypewriter (TTY), call 1 800 926-9105.

© Her Majesty the Queen in Right of Canada, 2012

PDF
Cat. No.: HS42-1/22-2012E-PDF
ISBN: 978-1-100-21598-3

FOREWORD

The Canadian Council of Directors of Apprenticeship (CCDA) recognizes this National Occupational Analysis (NOA) as the national standard for the occupation of Metal Fabricator (Fitter).

Background

The first National Conference on Apprenticeship in Trades and Industries, held in Ottawa in 1952, recommended that the federal government be requested to cooperate with provincial and territorial apprenticeship committees and officials in preparing analyses of a number of skilled occupations. To this end, Human Resources and Skills Development Canada (HRSDC) sponsors a program, under the guidance of the CCDA, to develop a series of NOAs.

The NOAs have the following objectives:

- to describe and group the tasks performed by skilled workers;
- to identify which tasks are performed in every province and territory;
- to develop instruments for use in the preparation of Interprovincial Red Seal Examinations and curricula for training leading to the certification of skilled workers;
- to facilitate the mobility of apprentices and skilled workers in Canada; and,
- to supply employers, employees, associations, industries, training institutions and governments with analyses of occupations.

ACKNOWLEDGEMENTS

The CCDA and HRSDC wish to express sincere appreciation for the contribution of the many tradespersons, industrial establishments, professional associations, labour organizations, provincial and territorial government departments and agencies, and all others who contributed to this publication.

Special acknowledgement is extended by HRSDC and the CCDA to the following representatives from the trade.

Brent Bolan	Saskatchewan
Joey Cain	Prince Edward Island
Doug Carr	Manitoba
Gordon Hunter	Alberta
Matthew McCarron	Nova Scotia
Jeff Soltesz	British Columbia
Ronald Stiles	New Brunswick
Dan Tremblay	Ontario
Philip White	International Association of Bridge, Structural, Ornamental and Reinforcing Iron Workers Union

This analysis was prepared by the Labour Market Integration Directorate of HRSDC. The coordinating, facilitating and processing of this analysis were undertaken by employees of the NOA development team of the Trades and Apprenticeship Division. The host jurisdiction of New Brunswick also participated in the development of this NOA.

Comments or questions about National Occupational Analyses may be forwarded to:

Trades and Apprenticeship Division
Labour Market Integration Directorate
Human Resources and Skills Development Canada
140 Promenade du Portage, Phase IV, 5th Floor
Gatineau, Quebec K1A 0J9
Email: redseal-sceaurouge@hrsdc-rhdcc.gc.ca

TABLE OF CONTENTS

FOREWORD I

ACKNOWLEDGEMENTS II

TABLE OF CONTENTS III

STRUCTURE OF ANALYSIS V

DEVELOPMENT AND VALIDATION OF ANALYSIS VII

ANALYSIS

SAFETY 3

SCOPE OF THE METAL FABRICATOR (FITTER) 4

OCCUPATIONAL OBSERVATIONS 6

ESSENTIAL SKILLS SUMMARY 7

BLOCK A COMMON OCCUPATIONAL SKILLS

Task 1 Performs safety-related functions. 9

Task 2 Maintains and uses tools and equipment. 11

Task 3 Organizes work. 15

Task 4 Performs quality assurance throughout fabrication and assembly process. 17

Task 5 Handles materials. 20

BLOCK B FABRICATION OF COMPONENTS

Task 6 Performs layout. 24

Task 7 Cuts materials. 27

Task 8 Forms materials. 33

BLOCK C ASSEMBLY OF COMPONENTS

Task 9 Fits and fastens sub-components and components. 36

Task 10	Performs welding activities.	40
Task 11	Completes project.	43

APPENDICES

APPENDIX A	TOOLS AND EQUIPMENT	47
APPENDIX B	GLOSSARY	50
APPENDIX C	ACRONYMS	53
APPENDIX D	BLOCK AND TASK WEIGHTING	54
APPENDIX E	PIE CHART	56
APPENDIX F	TASK PROFILE CHART	57

STRUCTURE OF ANALYSIS

To facilitate understanding of the occupation, the work performed by tradespersons is divided into the following categories:

Blocks	largest division within the analysis that is comprised of a distinct set of trade activities
Tasks	distinct actions that describe the activities within a block
Sub-Tasks	distinct actions that describe the activities within a task
Key Competencies	activities that a person should be able to do in order to be called 'competent' in the trade

The analysis also provides the following information:

Trends	changes identified that impact or will impact the trade including work practices, technological advances, and new materials and equipment
Related Components	list of products, items, materials and other elements relevant to the block
Tools and Equipment	categories of tools and equipment used to perform all tasks in the block; these tools and equipment are listed in Appendix A
Context	information to clarify the intent and meaning of tasks
Required Knowledge	elements of knowledge that an individual must acquire to adequately perform a task

The appendices located at the end of the analysis are described as follows:

Appendix A — Tools and Equipment	non-exhaustive list of tools and equipment used in this trade
Appendix B — Glossary	definitions or explanations of selected technical terms used in the analysis
Appendix C — Acronyms	list of acronyms used in the analysis with their full name
Appendix D — Block and Task Weighting	block and task percentages submitted by each jurisdiction, and the national averages of these percentages; these national averages determine the number of questions for each block and task in the Interprovincial exam
Appendix E — Pie Chart	graph which depicts the national percentages of exam questions assigned to blocks
Appendix F — Task Profile Chart	chart which outlines graphically the blocks, tasks and sub-tasks of this analysis

DEVELOPMENT AND VALIDATION OF ANALYSIS

Development of Analysis

A draft analysis is developed by a committee of industry experts in the field led by a team of facilitators from Human Resources and Skills Development Canada. This draft analysis breaks down all the tasks performed in the occupation and describes the knowledge and abilities required for a tradesperson to demonstrate competence in the trade.

Draft Review

The NOA development team then forwards a copy of the analysis and its translation to provincial and territorial authorities for a review of its content and structure. Their recommendations are assessed and incorporated into the analysis.

Validation and Weighting

The analysis is sent to all provinces and territories for validation and weighting. Participating jurisdictions consult with industry to validate and weight the document, examining the blocks, tasks and sub-tasks of the analysis as follows:

BLOCKS	Each jurisdiction assigns a percentage of questions to each block for an examination that would cover the entire trade.
TASKS	Each jurisdiction assigns a percentage of exam questions to each task within a block.
SUB-TASKS	Each jurisdiction indicates, with a YES or NO, whether or not each sub-task is performed by skilled workers within the occupation in its jurisdiction.

The results of this exercise are submitted to the NOA development team who then analyzes the data and incorporates it into the document. The NOA provides the individual jurisdictional validation results as well as the national averages of all responses. The national averages for block and task weighting guide the Interprovincial Red Seal Examination plan for the trade.

This method for the validation of the NOA also identifies common core sub-tasks across Canada for the occupation. If at least 70% of the responding jurisdictions perform a sub-task, it shall be considered common core. Interprovincial Red Seal Examinations are based on the common core sub-tasks identified through this validation process.

Definitions for Validation and Weighting

YES	sub-task performed by qualified workers in the occupation in a specific jurisdiction
NO	sub-task not performed by qualified workers in the occupation in a specific jurisdiction
NV	analysis Not Validated by a province/territory
ND	trade Not Designated in a province/territory
NOT COMMON CORE (NCC)	sub-task, task or block performed by less than 70% of responding jurisdictions; these will not be tested by the Interprovincial Red Seal Examination for the trade
NATIONAL AVERAGE %	average percentage of questions assigned to each block and task in Interprovincial Red Seal Examination for the trade

Provincial/Territorial Abbreviations

NL	Newfoundland and Labrador
NS	Nova Scotia
PE	Prince Edward Island
NB	New Brunswick
QC	Quebec
ON	Ontario
MB	Manitoba
SK	Saskatchewan
AB	Alberta
BC	British Columbia
NT	Northwest Territories
YT	Yukon Territory
NU	Nunavut

ANALYSIS

Safe working procedures and conditions, accident prevention, and the preservation of health are of primary importance to industry in Canada. These responsibilities are shared and require the joint efforts of government, employers and employees. It is imperative that all parties become aware of circumstances that may lead to injury or harm. Safe learning experiences and work environments can be created by controlling the variables and behaviours that may contribute to accidents or injury.

It is generally recognized that safety-conscious attitudes and work practices contribute to a healthy, safe and accident-free work environment.

It is imperative to apply and be familiar with the Occupational Health and Safety (OH&S) Acts and Workplace Hazardous Materials Information System (WHMIS) regulations. As well, it is essential to determine workplace hazards and take measures to protect oneself, co-workers, the public and the environment.

Safety education is an integral part of training in all jurisdictions. As safety is an imperative part of all trades, it is assumed and therefore it is not included as a qualifier of any activities. However, the technical safety tasks and sub-tasks specific to the trade are included in this analysis.

SCOPE OF THE METAL FABRICATOR (FITTER)

"Metal Fabricator (Fitter)" is this trade's official Red Seal occupational title approved by the CCDA. This analysis covers tasks performed by metal fabricators (fitters) whose occupational title has been identified by some provinces and territories of Canada under the following names:

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
Metal Fabricator (Fitter)	✓	✓				✓				✓			
Metal Fabricator - Fitter			✓										
Steel Fabricator							✓	✓					
Steel Fabricator (Fitter)				✓									
Steel Frame Assembler					✓								
Structural Steel and Plate Fitter									✓				
Welder/Fitter					✓								

Metal fabricators (fitters) make and repair metal parts used in the construction of buildings, bridges, tanks, towers, boilers, pressure vessels and other structures and products. They develop patterns. They lay out, cut and fabricate structural steel, plate, and miscellaneous ferrous and non-ferrous metals for use in a wide variety of manufacturing and construction industries. They also assemble and fit metal sections and plates together to form complete units or sub-units such as frames, plates, girders and chutes that are used later in the assembly process.

Metal fabricators (fitters) must have the ability to interpret fabrication drawings and specifications. They select materials to accomplish their work. Metal fabricators (fitters) use tools and equipment such as press brakes, shears, plasma cutters, oxy-fuel cutting torches, grinders and drills to bend, cut, punch, drill or form metal components. They may also use computer numerical controlled (CNC) equipment. They fasten components together by using methods such as welding, bolting and riveting. They also use material handling and rigging, hoisting and lifting equipment to move materials and completed assemblies.

Skills important to metal fabricators (fitters) include the ability to visualize in three-dimensions, good coordination, mechanical aptitude, manual dexterity and the ability to perform work-related mathematical calculations.

There are risks associated with this trade such as working in close quarters, at heights, and with power tools, welding equipment and heavy materials.

Metal fabricators (fitters) usually work indoors in fabricating shops or factories. Some may also work outdoors fitting and fastening sub-assemblies. They may be employed by welding or ironworking companies, or by manufacturers of structural steel, boilers, heavy machinery and transportation equipment. They can also find employment in other sectors including maintenance, shipbuilding, fishing, agricultural equipment, railways, aviation, mining and the oil and gas industry.

This analysis recognizes similarities or overlaps with the work of welders, sheet metal workers, ironworkers, steamfitter/pipefitters, millwrights and boilermakers. Metal fabricators (fitters) often hold welding certification.

With experience, metal fabricators (fitters) may act as mentors and trainers to apprentices in the trade. They may advance to positions such as lead hand, supervisor, quality assurance/quality control inspector, or contract manager, or set up their own shops.

OCCUPATIONAL OBSERVATIONS

New technologies introduced to the workplace include water jet and laser cutting. This equipment provides more detailed, accurate cuts on the parts used by metal fabricators (fitters). As the high cost of this equipment comes down, more shops are willing to invest in this technology. However, specialized shops often provide these services to other fabrication shops.

The use of CNC equipment such as plate rolls and press brakes is becoming more prevalent. The use of CNC equipment and computer-assisted design (CAD) software increases the efficiency and accuracy of the fabrication process.

Familiarity with the range of alloys available is becoming more important in this trade. Alloys are being used more often because of factors such as durability, cost effectiveness and weight.

To reduce accidents and promote awareness, safety regulations are becoming more stringent, resulting in more safety training and certification. Environmental concerns and awareness have increased.

ESSENTIAL SKILLS SUMMARY

Essential skills are needed for work, learning and life. They provide the foundation for learning all other skills and enable people to evolve with their jobs and adapt to workplace change.

Through extensive research, the Government of Canada and other national and international agencies have identified and validated nine essential skills. These skills are used in nearly every occupation and throughout daily life in different ways.

A series of CCDA-endorsed tools have been developed to support apprentices in their training and to be better prepared for a career in the trades. The tools can be used independently or with the assistance of a tradesperson, trainer, employer, teacher or mentor to:

- understand how essential skills are used in the trades;
- learn about individual essential skills strengths and areas for improvement; and
- improve essential skills and increase success in an apprenticeship program.

The tools are available online or for order at: www.hrsdc.gc.ca/essentialskills

The essential skills profile for the metal fabricator (fitter) trade indicates that the most important essential skills are **document use, numeracy, thinking (problem solving)** and **communication.**

The application of these skills may be described throughout this document within the competency statements which support each subtask of the trade. The following are summaries of the requirements in each of the essential skills, taken from the essential skills profile. A link to the complete essential skills profile can be found at www.red-seal.ca.

Reading
Metal fabricators (fitters) require reading skills to gather information from forms and labels. They also need to read to understand more complex texts such as equipment and policy and procedure manuals, specifications, codes and standards.

Document Use
Metal fabricators (fitters) locate and interpret information in several types of documents such as labels, signs, forms, lists, tables, technical drawings and specifications. They interpret fabrication drawings to determine how ferrous and non-ferrous materials should be cut and assembled by integrating plan views, elevation and section drawings as well as synthesizing information from other prints about adjacent components of the fabrication. Metal fabricators (fitters) also prepare documents such as sketches and forms.

Writing
Writing skills are used by metal fabricators (fitters) to write short texts. Examples of written work include logbook entries, quality assurance reports and production problem reports.

Oral Communication
Metal fabricators (fitters) discuss equipment maintenance and repair with suppliers, and specifications and plans with co-workers, supervisors and general contractors. They may supervise and direct the work of apprentices. Because of constant noise, metal fabricators (fitters) may also communicate through hand signals, gestures and sometimes notes.

Numeracy
Numeracy skills are very important in the everyday work of metal fabricators (fitters). Mathematical skills are used in taking measurements, doing material layout, using formulas, preparing cut lists and preparing jigs according to specifications in fabrication drawings.

Thinking Skills
Metal fabricator (fitters) may suggest modifications to project designs to correct flaws, for example when fabrication drawing specifications do not take into account the space needed for welds. They need the ability to think spatially and visualize in three dimensions. On the job they are required to problem solve on a regular basis, such as trouble shooting equipment problems and making repairs.

Working with Others
Metal fabricators (fitters) generally work independently to fabricate and fit metal structures following fabrication drawing specifications, though they may work with others to complete large projects. Metal fabricators (fitters) co-ordinate work with supervisors, co-workers, quality control staff and with workers from other trades such as millwrights or welders.

Computer Use
Metal fabricators (fitters) may input parameters for CNC equipment such as press brakes or cutting tables. They may also use computer technology during pattern development. They may need to have a basic knowledge of CAD software to prepare layouts and interpret plans and drawings.

Continuous Learning
Metal fabricators (fitters) have a need to engage in ongoing learning to acquire information about health and safety, new products, metal fabrication procedures, metal properties and quality assurance standards. They must maintain skills and certification according to industry and jurisdictional regulatory authorities. New learning is acquired as part of regular work activities, by participating in industry specific training sessions, reading trade journals and talking to other metal fabricators (fitters).

BLOCK A — COMMON OCCUPATIONAL SKILLS

Trends

Safety regulations continue to become more stringent resulting in an increase in certification for different types of machinery and equipment. There is an increased emphasis in the use of personal protective equipment (PPE) and training.

New technology is making its way into the workplace. Computerized and automated machinery such as robotic welding and assembly equipment are being implemented.

Emphasis on quality assurance and control is increasing.

Related Components

All components apply.

Tools and Equipment

See Appendix A.

Task 1 — Performs safety-related functions.

Context

Metal fabricator (fitters) will encounter many hazards in their work environment. These hazards are diminished by training, by the use of PPE and safety equipment, and by maintaining a safe work environment.

Required Knowledge

K 1	company safety policies and procedures
K 2	workers' rights and responsibilities
K 3	site-specific training requirements
K 4	housekeeping practices
K 5	site-specific emergency procedures and evacuation plans
K 6	on-site safety locations such as first aid stations, eye wash stations, muster points and fire extinguishers
K 7	disposal and recycling procedures
K 8	types of PPE such as respirators, face shields, hearing protection, safety boots, safety gloves and safety glasses
K 9	safety equipment such as fire extinguishers and grinder guards

K 10	tag-out and lock-out procedures
K 11	emergency shut down devices
K 12	OH&S and WHMIS

Sub-task

A-1.01 Maintains safe work environment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-1.01.01	identify and prevent potential injury from hazards such as heights, confined spaces, moving machinery, overhead wires, toxic fumes and hazardous substances
A-1.01.02	report hazards according to company policy and OH&S requirements
A-1.01.03	participate in site orientation and safety training
A-1.01.04	handle and store hazardous materials such as acids and compressed gases in designated areas according to company policy, WHMIS and Material Safety Data Sheets (MSDS)
A-1.01.05	install temporary safety protection such as barriers and lock-outs
A-1.01.06	practice good housekeeping
A-1.01.07	ensure clear line of path when moving material
A-1.01.08	identify and remove damaged tools and equipment from service
A-1.01.09	ensure stationary machines' range of motion is unobstructed
A-1.01.10	ensure guards and shielding are in place according to manufacturers' specifications
A-1.01.11	locate on-site safety locations such as first aid stations, eye wash stations, muster points (assembly area) and fire extinguishers
A-1.01.12	tag-out and lock-out defective equipment

Sub-task

A-1.02 **Uses personal protective equipment (PPE) and safety equipment.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-1.02.01	select PPE and safety equipment according to hazard and company policy
A-1.02.02	store and maintain PPE and safety equipment according to manufacturers' specifications
A-1.02.03	identify unsafe, worn, damaged, expired and defective PPE and safety equipment and remove from service
A-1.02.04	adjust PPE such as hard hat, respirator protection and fall protection equipment to ensure proper fit
A-1.02.05	wear PPE and operate safety equipment according to manufacturers' specifications

Task 2 Maintains and uses tools and equipment.

Context Metal fabricators (fitters) must use and maintain tools and equipment in order to safely and effectively perform the duties of their trade.

Required Knowledge

K 1	types of hand tools such as hammers, files and clamps
K 2	use of hand tools
K 3	electric power tools such as grinders, drills and saws
K 4	pneumatic power tools such as grinders and drills
K 5	hydraulic power tools such as punches and jacks
K 6	rpm rating of power tools and attachments
K 7	storage requirements and uses for consumables such as abrasive cutting and grinding discs
K 8	types of layout tools such as squares, dividers, levels and trammel points
K 9	types of measuring tools such as calipers, steel gauges and measuring tapes
K 10	types of stationary machinery such as shears, drill presses, brakes, ironworkers and forming rolls

K 11	location of lubrication points
K 12	types of lubricants such as grease and gear oil
K 13	types of coolants
K 14	safe operating procedures
K 15	types of cutting equipment such as plasma and oxy-fuel
K 16	types of welding equipment
K 17	components of cutting equipment such as regulators, tips and hoses
K 18	types of access equipment such as scissor lifts, scaffolding, ladders and man lifts
K 19	training and certification requirements
K 20	PPE
K 21	safety regulations

Sub-task

A-2.01 Maintains hand, power, layout and measuring tools and equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-2.01.01	sharpen striking tools such as chipping hammers, chisels and center punches and remove mushroomed heads from tools
A-2.01.02	identify and sharpen dull and damaged cutting edges on drill bits
A-2.01.03	place tools and equipment in locations to minimize risk of damage or loss
A-2.01.04	store tools, equipment and consumables in designated area to avoid damage
A-2.01.05	identify worn, damaged and defective tools and equipment and take corrective action
A-2.01.06	check and top-up fluids in hydraulic tools
A-2.01.07	lubricate pneumatic tools and ensure air supply is dry and clean
A-2.01.08	clean tools and equipment after use
A-2.01.09	visually check cords and switches on electric tools for damage
A-2.01.10	check accuracy and calibrate layout and measuring tools

Sub-task

A-2.02 Maintains stationary machinery.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-2.02.01	remove debris such as steel shavings and off-cuts to keep work surface functional and safe
A-2.02.02	lubricate stationary machinery to ensure smooth operation and function
A-2.02.03	check and top-up coolant reservoir on drill presses and saws
A-2.02.04	inspect cutting dies and blades for damage such as chips, nicks and missing teeth to ensure safe operation and quality product
A-2.02.05	inspect forming dies for damage and debris
A-2.02.06	identify worn, damaged and defective parts in stationary machinery and take corrective action such as replacement or reconditioning
A-2.02.07	tag-out and lock-out defective stationary machinery prior to maintenance
A-2.02.08	ensure stationary machines' range of motion is unobstructed
A-2.02.09	adjust tool rests on pedestal grinders and other rotating equipment to ensure safe operation
A-2.02.10	ensure guards and shielding are in place according to manufacturers' specifications
A-2.02.11	inspect and replace filters in stationary machines such as fume extractor and air compressors according to jurisdictional requirements

Sub-task

A-2.03 Maintains cutting and welding equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-2.03.01	identify, and repair or replace damaged gas lines to cutting and welding equipment
A-2.03.02	perform diagnosis of cutting and welding equipment problems such as inconsistent operation and poor quality of cut and welds

A-2.03.03	clean and store cutting and welding equipment
A-2.03.04	clean or replace consumables such as tips, diffusers, electrodes and nozzles
A-2.03.05	identify worn, damaged and defective cutting and welding equipment and take corrective action such as replacement or reconditioning
A-2.03.06	clean or replace damaged lenses in equipment such as welding helmets and cutting shields
A-2.03.07	identify hazards and tag-out and lock-out cutting and welding equipment

---

Sub-task

A-2.04 Uses access equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-2.04.01	select access equipment such as scaffolding, ladders and man-lifts according to job requirements
A-2.04.02	verify scaffolding is secure, level and stable
A-2.04.03	verify footing of ladders is secure, level and stable
A-2.04.04	inspect equipment for operation and compliance
A-2.04.05	identify unsafe, worn, damaged and defective access equipment and take corrective action
A-2.04.06	operate equipment such as scissors-lifts and man-lifts according to manufacturers' specifications, and jurisdictional and OH&S requirements
A-2.04.07	plan travel route and account for operational range of mobile access equipment for safety
A-2.04.08	cordon off work area
A-2.04.09	perform routine maintenance such as fluid top-ups and re-fuelling on access equipment
A-2.04.10	secure and store access equipment in designated area according to company policy

Task 3 Organizes work.

Context In order to organize their work, metal fabricators (fitters) must be able to use documents and drawings, recognize hazards in the work site, communicate effectively with others and plan their project tasks.

Required Knowledge

K 1	types of drawings such as detail, shop and fabrication
K 2	orthographic and isometric views
K 3	types of specifications such as tolerances and material types
K 4	imperial and metric systems
K 5	trade terminology
K 6	communication methods such as verbal, written and hand signals
K 7	communication in confined spaces
K 8	task requirements such as work space, materials and supplies
K 9	approximate time required to complete project task
K 10	finished project restrictions such as ability to remove project from fabrication shop, crane limitations and transportation considerations
K 11	CAD produced layouts
K 12	roles and responsibilities, and chain of command
K 13	emerging technologies

Sub-task

A-3.01 Interprets plans, drawings and specifications.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-3.01.01	select and use tools and equipment such as a calculators and computers
A-3.01.02	review drawing looking for discrepancies or lack of information
A-3.01.03	visualize in three dimensions to plan the steps of the build and understand scope of work
A-3.01.04	generate cut lists and part lists
A-3.01.05	interpret welding symbols and general notes

A-3.01.06	interpret types of lines such as broken, hidden, centre and section lines
A-3.01.07	locate section and detail views
A-3.01.08	convert between imperial and metric measurements
A-3.01.09	refer to bill of materials to identify piece marks

Sub-task

A-3.02 Communicates with others.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-3.02.01	coordinate work with supervisors, co-workers and other tradespersons such as industrial mechanics (millwrights) and welders to accomplish task
A-3.02.02	convey information with as much detail as possible, using drawings, and written and verbal instruction to minimize misunderstandings
A-3.02.03	use communication methods considering job requirements such as working in confined spaces
A-3.02.04	use communication equipment such as radios, cell phones and computers
A-3.02.05	communicate with colleagues and supervisors to establish roles and responsibilities during critical operations
A-3.02.06	consult with colleagues to resolve problems, find solutions and establish best practices
A-3.02.07	maintain professionalism and respect in communication with others
A-3.02.08	mentor apprentices

Sub-task

A-3.03 **Organizes project tasks.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-3.03.01	determine required equipment, material and manpower to complete job
A-3.03.02	determine fabrication sequence required according to availability of resources
A-3.03.03	schedule jobs and tasks based on availability of resources and access to site
A-3.03.04	anticipate safety requirements
A-3.03.05	coordinate tasks with coworkers and other trades
A-3.03.06	set-up work area
A-3.03.07	adapt to changing conditions

Task 4 — Performs quality assurance throughout fabrication and assembly process.

Context Metal fabricators (fitters) inspect, document, track materials for traceability and verify critical measurements to ensure quality. Quality assurance is important in this trade in order to produce products within tolerances, save time and money, and avoid liability issues.

Required Knowledge

K 1	types of materials such as carbon steel, stainless steel and aluminium
K 2	measurements to be verified such as raw material, on-going dimensional checks and final product measurements
K 3	causes of changes in dimensions such as heating and cooling
K 4	types of reference lines such as tangent lines, centre lines and work points
K 5	conditions to check for, such as changes in dimensions, distortion, squareness and discolouration
K 6	sequence of fabrication process
K 7	reasons for marking material and parts such as traceability, and identification for fabrication and erection

K 8	mill certifications and heat numbers
K 9	company method of assigning piece marks and checking layout
K 10	crucial work points to be verified
K 11	fabrication drawings
K 12	coatings and finishes
K 13	responsibilities within quality control system

Sub-task

A-4.01 Performs visual inspections.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-4.01.01	verify minimum quality requirements
A-4.01.02	check mill materials for deformities and dimensional inaccuracy
A-4.01.03	check for shipping damages such as twists, deformities and scratches in material
A-4.01.04	check for factors such as piece count and approximate dimensions
A-4.01.05	check for obvious omissions such as missed welds and parts
A-4.01.06	check for surface imperfections such as welding spatter, gouges and sharp edges
A-4.01.07	check for weld defects such as porosity, undercut, and crater cracks
A-4.01.08	check for fabrication defects such as distortion, improper fit-up and piece alignment
A-4.01.09	identify location of defect and implement corrective measures

Sub-task

A-4.02 **Verifies measurements, welds and layout.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-4.02.01	select and use tools and equipment such as measuring tapes, lasers, fillet gauges, levels, squares, protractors and dividers
A-4.02.02	verify required tolerances
A-4.02.03	check dimensions of goods received against bill of lading
A-4.02.04	check raw material size, length and thickness
A-4.02.05	check dimensions including angles, orientation and slopes of components and sub-components such as stiffeners, gussets and clips
A-4.02.06	check dimensions of hole patterns
A-4.02.07	check dimensional accuracy of fabricated assemblies such as jigs, square frames, trusses, and stairs using triangulation and other methods
A-4.02.08	check weld size and location
A-4.02.09	confirm layout and fit-up using jigs and templates

Sub-task

A-4.03 **Tracks materials and parts for traceability.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-4.03.01	obtain and record part and job number from drawings
A-4.03.02	ensure mill certification kept for future reference
A-4.03.03	transfer information such as heat numbers and size of material from parent piece to cut-off and crop pieces

A-4.03.04	select and use marking devices including roller pens, crayon markers, stamps, tags and barcodes according to finishing requirements such as painting and galvanizing
A-4.03.05	verify and complete documentation such as weld maps, welders' identification, welder qualification and other quality assurance records according to company policy

Task 5 Handles materials.

Context

Metal fabricators (fitters) need to identify the material required and determine weight, shape and size before it is transferred. They transfer the loads using rigging, hoisting and lifting equipment, and other material handling equipment such as forklifts, conveyor rollers, dollies and carts.

Lifts are planned to ensure that the proper rigging practices and safety factors are taken into account. Rigging equipment is used so that loads can be hoisted in a safe and secure manner.

Required Knowledge

K 1	types of material such as sheets and bar stocks, pipes and tubing
K 2	types of components such as cut-to-size pieces, flanges and elbows
K 3	storage location and requirements
K 4	company method of assigning piece marks
K 5	mathematics as applicable to this trade
K 6	types of rigging methods such as knots, chokers and basket hitches
K 7	types of rigging devices such as slings, chains and wire ropes
K 8	safe lifting angles
K 9	material characteristics, weight, shape, grade and dimension
K 10	types of material handling equipment such as overhead cranes, forklifts, carts, conveyor rollers and dollies
K 11	certification requirements for operating material handling equipment
K 12	working load limit (WLL)
K 13	refuelling procedures
K 14	lifting device capacity
K 15	log books for equipment such as cranes, forklifts and manlifts

K 16	hand signals
K 17	emergency stop devices

Sub-task

A-5.01 Organizes material.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-5.01.01	identify and select material such as steel alloy, stainless steel and aluminium
A-5.01.02	identify and select profile such as beams, piping, tubing and channel
A-5.01.03	verify unmarked material selected is suitable for the job requirement
A-5.01.04	determine quantities required considering factors such as cut list
A-5.01.05	check availability of material and notify responsible individual of out of stock situations
A-5.01.06	locate and verify components and sub-assemblies such as cut-to-size pieces, flanges, elbows and pre-cut parts
A-5.01.07	group material considering factors such as alloys, profiles, sizes, weights and grades
A-5.01.08	sequence materials according to job priority
A-5.01.09	store and protect vulnerable materials such as stainless steel and aluminium

---

Sub-task

A-5.02 Determines weights.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-5.02.01	refer to documents such as drawings, reference manuals and suppliers' catalogues for weight
A-5.02.02	identify types of material to determine weight

A-5.02.03	calculate volume and weight
A-5.02.04	select and use tools and equipment such as sheet and plate gauges, load indicators, calipers and measuring tapes

---

Sub-task

A-5.03 Applies rigging practices.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-5.03.01	select rigging equipment such as slings, chains, chokers, softeners and plate clamps according to requirements such as weight, manoeuvrability and space
A-5.03.02	verify safe condition of rigging equipment and remove defective equipment from service
A-5.03.03	visualize lifting operation to determine lifting points, travel path and identify potential issues such as weak points and potential hazards in the load
A-5.03.04	select lay down area and prepare blocking to suit load
A-5.03.05	determine centre of gravity to balance load
A-5.03.06	attach rigging to predetermined lifting points
A-5.03.07	confirm load stability, lifting points and rigging by performing a test lift and adjust accordingly
A-5.03.08	maintain control of lift using tag lines
A-5.03.09	interpret load chart

Sub-task

A-5.04 Operates material handling equipment.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

A-5.04.01	select material handling equipment such as forklifts, chain falls, carts, conveyor rollers, shop cranes and dollies according to need and availability
A-5.04.02	perform inspection and confirm safe operation of material handling equipment

A-5.04.03	adjust material handling equipment and secure load
A-5.04.04	plan lift and path of travel to minimize lift time and hazards, and confirm lay down area
A-5.04.05	monitor load during transfer
A-5.04.06	ensure hoisted load does not travel over personnel
A-5.04.07	place load in pre-selected area according to orientation required
A-5.04.08	interpret load chart

BLOCK B — FABRICATION OF COMPONENTS

Trends	CAD is used for the design of components resulting in a shift of pattern development from the shop floor into the design office. CNC equipment such as press brakes, cutting tables and plate rolls is becoming the industry standard. Metal fabricators (fitters) work with an increasing variety and volume of alloys.
Related Components (including, but not limited to)	**Assemblies:** structural steel, pressure vessels, tanks, conveyors, ships, duct work, process piping, machine bases, bridges. **Metals:** steel, stainless steel, aluminium and their alloys.
Tools and Equipment	See Appendix A.

Task 6 — Performs layout.

Context

Metal fabricators (fitters) lay out materials before any fabrication procedure such as cutting, drilling, bending and welding. It is important that the layout be done properly to prevent waste, and ensure proper fit and accuracy.

Required Knowledge

K 1	types of layout methods such as parallel line development, radial line development and triangulation and their applications
K 2	CAD produced layouts
K 3	shapes and patterns
K 4	pattern development techniques
K 5	mathematics as applicable to this trade such as conversions, fractions, geometric formulas and trigonometric functions
K 6	imperial and metric systems
K 7	bending, rolling and cutting allowances
K 8	machinery and equipment capacities and limits
K 9	angular dimensions, running dimensions and incremental dimensions

K 10	types of templates such as hole-punching templates, wrap-arounds, cutting templates and arc templates (sweeps)
K 11	template materials such as wood, cardboard and metal
K 12	drawing specifications

Sub-task

B-6.01 Performs pattern development.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-6.01.01	visualize finished product in three dimensions
B-6.01.02	visualize flat pattern required to build the finished product
B-6.01.03	determine layout method such as radial line, parallel line and triangulation development according to design requirements
B-6.01.04	select and use tools such as squares, trammel points, compasses and measuring tapes
B-6.01.05	establish working point and axis to determine starting point
B-6.01.06	develop views required for fitting such as plan view and elevation view
B-6.01.07	consider factors such as size, material usage and seam location to maximize efficiency and quality

---

Sub-task

B-6.02 Calculates material allowances for various processes.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-6.02.01	determine total material required by considering factors such as bend and weld allowances, kerf, and job requirements
B-6.02.02	perform mathematical calculations and use formulas to determine requirements such as stretch-out length, true length and angular measurements

B-6.02.03 determine bend radius according to factors such as charts, reference materials and available equipment

B-6.02.04 allow for excess material necessary for rolling to allow flat spot removal

---

Sub-task

B-6.03 Determines dimensions.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-6.03.01 extract required information from drawings to calculate material dimensions

B-6.03.02 perform geometric calculations such as $a^2 + b^2 = c^2$, diameter of circles and areas to calculate material dimensions

B-6.03.03 calculate arc measurements from angular dimensions to determine true length of arc

B-6.03.04 select and use measuring and layout tools such as protractors, stair gauges and dividers

---

Sub-task

B-6.04 Transfers dimensions.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-6.04.01 establish work point and mark surfaces on components according to layout and drawings

B-6.04.02 ensure that transferred marks are accurately located by using measuring and layout tools such as bevel squares, measuring tapes, plumb bobs and soapstone

B-6.04.03 locate work points such as centre lines and quarter marks to determine location and orientation of components according to drawings

B-6.04.04 lay out incline and slope using rise and run, and angular dimensions

B-6.04.05 transfer top dead centre from one end of a cylinder to the other end using tools such as 2-foot square, 2-foot level and straight edge

Sub-task

B-6.05 **Makes templates.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-6.05.01	lay out templates by performing manual drafting techniques
B-6.05.02	select and use tools such as scissors and tin snips according to material such as cardboard and metal used to construct templates
B-6.05.03	mark template with information such as part numbers, layout information and material required for identification

Task 7 Cuts materials.

Context

Metal fabricators (fitters) cut materials according to the layouts and specifications. Accurate cuts are important to the final assembly. Journeypersons must master the use of several pieces of heavy duty and sophisticated cutting equipment to perform these tasks. Joint preparation is done in advance of the welding process. Safety practices are critical.

Required Knowledge

K 1	types of plasma cutting equipment such as manual and automated
K 2	pressure settings
K 3	cutting processes for different materials
K 4	capacities and limitations of cutting equipment
K 5	oxy-fuel cutting equipment, components and consumables
K 6	various gases and their properties
K 7	types of shears such as mechanical and hydraulic
K 8	shear cut-off minimums to reduce twist
K 9	safety features of cutting equipment
K 10	types of saws such as band saws, abrasive saws and cold saws
K 11	saw characteristics such as blade types, tooth pitch and blade thickness
K 12	stations on ironworkers and their functions

K 13	type of ironworker such as hydraulic, mechanical and pneumatic
K 14	types of holes such as blind holes and pilot holes
K 15	thread profiles such as National Pipe Tapered (NPT), National Coarse (NC), National Fine (NF) and metric
K 16	internal and external threads
K 17	left- and right-handed threads
K 18	types of drill bits such as twist and core
K 19	imperial and metric measurements
K 20	types of joints preparation such as bevels, U-groove and V-groove
K 21	welding requirements of joint preparation
K 22	welding symbols
K 23	types of CNC equipment such as plasma, oxy-fuel, laser and water jet cutters
K 24	operation procedures of CNC equipment
K 25	hazards such as pinch points and noise

Sub-task

B-7.01 **Cuts material using manual plasma cutting equipment.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.01.01	set up plasma cutting equipment according to machine capacity and manufacturers' specifications
B-7.01.02	operate manual plasma cutting equipment according to the manufacturers' specifications
B-7.01.03	ensure straight or profiled edge using methods such as free-hand or guided cutting

Sub-task

B-7.02 **Cuts material using manual oxy-fuel cutting equipment.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.02.01	verify type and thickness of material can be cut according to equipment capacity
B-7.02.02	set up and take down oxy-fuel cutting equipment
B-7.02.03	select and adjust gas pressure and tip sizes according to material thickness
B-7.02.04	adjust flame to neutral
B-7.02.05	ensure straight or profiled edge using methods such as free-hand or guided cutting
B-7.02.06	minimize distortion of material by anticipating the effects longitudinal, angular and transverse distortion as a result of heat input

Sub-task

B-7.03 **Cuts material using shears.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.03.01	verify type and thickness of material that can be sheared according to equipment capacity
B-7.03.02	operate shears using automated or manual controls
B-7.03.03	adjust rake angle and blade clearance settings according to manufacturers' specifications and material characteristics
B-7.03.04	adjust back gauges to position material
B-7.03.05	ensure safety features such as guards and dead man pedal are in place according to manufacturers' specifications

Sub-task

B-7.04 **Cuts material using saws.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.04.01	verify type and thickness of material that can be cut according to equipment capacity
B-7.04.02	select blade types, styles and tooth pitches according to the grade, shape and dimensions of material to be cut
B-7.04.03	determine speed and feed rate of cut according to factors such as blade type, and hardness and thickness of material
B-7.04.04	select and use coolants to prolong blade life and improve quality of cut
B-7.04.05	use jigs, gauges and backstops during cutting operations with multiple cuts
B-7.04.06	ensure safety features such as guards and emergency stop buttons are in place according to manufacturers' specifications

Sub-task

B-7.05 **Cuts material using ironworkers.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.05.01	verify type and thickness of materials that can be processed according to equipment capacity
B-7.05.02	set up ironworker equipment according to function such as punching, shearing, notching and forming to be performed
B-7.05.03	use jigs, gauges and backstops during processing operations for repeatability
B-7.05.04	ensure safety features such as guards and emergency stop buttons are in place according to manufacturers' specifications

Sub-task

B-7.06 **Cuts material using computer numerical controlled (CNC) equipment.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	no	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.06.01	verify type and thickness of material that can be processed according to equipment capacity
B-7.06.02	adjust settings of consumables such as tips, electrodes and nozzles on cutting equipment according to material being cut
B-7.06.03	select gas type such as nitrogen, hydrogen and oxygen to be used for cutting different materials with cutting equipment
B-7.06.04	select cut pattern according to job requirements
B-7.06.05	nest cut patterns to minimize material waste
B-7.06.06	ensure safety features such as guards and emergency stop buttons are in place according to manufacturers' specifications

Sub-task

B-7.07 **Drills holes.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.07.01	select and use drilling equipment such as hand, magnetic based and radial drills according to job requirements
B-7.07.02	set up drills to account for speed and feed rates of cutters, hole dimensions and type of material
B-7.07.03	use clamping devices such as vices, jigs and hold-downs to ensure positioning and avoid slippage of material
B-7.07.04	select and use cutting fluids such as oils and water to cool cutting surface and remove drill shavings

Sub-task

B-7.08 Cuts threads.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	no	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.08.01	select and use threading tools and equipment such as taps, dies and pipe threaders
B-7.08.02	select speed and feed rates according to manufacturers' specifications and job requirements
B-7.08.03	use clamping devices to ensure positioning and avoid slippage of material
B-7.08.04	select and use cutting fluids such as oils and water to cool cutting surface and remove debris

Sub-task

B-7.09 Prepares joints.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-7.09.01	select and use equipment for edge bevelling and grooving such as oxy-fuel cutting equipment, plasma cutters and nibblers
B-7.09.02	maintain dimensional consistency throughout joint length according to job specifications
B-7.09.03	clean joints and remove contaminants such as slag and oil to prevent weld defect

Task 8 — Forms materials.

Context

Metal fabricators (fitters) use specialized equipment such as press brakes, plate rollers, shape rollers and benders to form materials into specified shapes. They may apply heat to facilitate the forming of these materials.

Required Knowledge

K 1	material metallurgy and characteristics such as workability, grain direction and elasticity
K 2	types of plate rollers such as pyramid rollers and initial pinch rollers
K 3	limitations and capacities of forming equipment
K 4	types of shape rollers such as angle rollers and tubing rollers
K 5	types of benders such as manual benders, pipe benders and mandrel benders
K 6	types of press brakes such as hydraulic and mechanical
K 7	hazards such as pinch points, noise, and fire
K 8	minimum bend radius for various materials
K 9	heating requirements for forming various materials
K 10	indicators of temperature such as colour of heated materials

Sub-task

B-8.01 **Forms material using plate rollers.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-8.01.01	pre-form material ends to account for limitations of rollers
B-8.01.02	adjust plate rollers according to radius during forming
B-8.01.03	monitor material by using sweep template to ensure amount of roll is consistent with job specifications

Sub-task

B-8.02 **Forms material using shape rollers.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-8.02.01	select and change dies according to material shape
B-8.02.02	adjust shape rollers according to radius during forming
B-8.02.03	monitor material by using sweep template to ensure amount of roll is consistent with job specifications

Sub-task

B-8.03 **Forms material using conventional and computer numerical controlled (CNC) press brakes.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-8.03.01	select and use dies according to job specifications such as bend radius and desired shape
B-8.03.02	determine bend sequence according to equipment clearance and profile of desired shape
B-8.03.03	set up back stops according to required dimensions to aid in forming repeated bends
B-8.03.04	monitor bends for irregularities during forming and adjust equipment settings to compensate
B-8.03.05	select and use templates to verify bend profile

Sub-task

B-8.04 **Forms material using benders.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-8.04.01	select, change and set up dies according to material shape
B-8.04.02	adjust benders according to radius during forming
B-8.04.03	monitor material by using measuring and layout tools to ensure bend is consistent with job specifications

Sub-task

B-8.05 **Applies heat for forming.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

B-8.05.01	use jigs for manual forming to ensure consistency of end product
B-8.05.02	select and use heating equipment such as induction heaters, oxy-fuel torches and ovens according to material size, type and shape
B-8.05.03	measure temperature of heated material considering factors such as structural integrity and optimal temperature
B-8.05.04	determine location of heat application according to job specifications such as bend location and desired shape
B-8.05.05	correct distortions in distorted metals through the use of heat

BLOCK C — ASSEMBLY OF COMPONENTS

Trends	The assembly process has changed very little. However, the types of fasteners are improving to help productivity and the ease of inspection. There has been an increase in the regulation and awareness of safety and environmental issues.
Related Components (including, but not limited to)	**Assemblies:** structural steel, pressure vessels, tanks, conveyors, ships, duct work, process piping, machine bases, bridges. **Metals:** steel, stainless steel, aluminium and their alloys.
Tools and Equipment	See Appendix A.

Task 9 — Fits and fastens sub-components and components.

Context

After fabricating sub-components of a product, metal fabricators (fitters) must assemble them to create a component. They must follow sequential steps to do the job while staying within tolerances and specifications. While the bulk of these operations are done within the fabrication shop, occasionally, minor field assembly work may be done on the job site where the final assembly occurs.

Required Knowledge

K 1	plans and specifications
K 2	available equipment
K 3	tools and equipment capabilities
K 4	operation of equipment
K 5	assembly constraints such as building size and equipment limits
K 6	site accessibility and layout
K 7	existing components and vessels
K 8	scope of work
K 9	assembly process
K 10	starting point
K 11	installation methods

K 12	types of fastening devices such as pins, rivets, bolts and clips, and their specifications
K 13	materials and their characteristics
K 14	inspection requirements for the components such as hold points
K 15	dimensional tolerances
K 16	site and company policies and procedures such as safety and orientation
K 17	specifications, procedures and tolerances for welding and torque
K 18	jurisdictional rules and certification requirements
K 19	communication methods such as hand signals, radios, cell phones, computers and verbal

---

Sub-task

C-9.01 Assembles jigs.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-9.01.01	select and use tools and equipment according to product being built
C-9.01.02	select materials for jig based on factors such as cost and availability, and accuracy and quantity requirements of finished products
C-9.01.03	establish necessary axes, planes and work points according to product being built
C-9.01.04	layout jig location such as on plate, shop horses and floor surface according to fabrication drawing
C-9.01.05	fasten stops and hold-downs to the jig for accuracy and for ease of removal of fabricated product
C-9.01.06	mark jigs for future use with information such as part numbers, material required and work orders

Sub-task

C-9.02 **Determines proper sequence for assembly.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-9.02.01	refer to documents such as drawings for detailed information such as size of product and types of material
C-9.02.02	visualize finished components prior to assembly
C-9.02.03	define steps in the process for efficiency and accuracy to prevent re-work while considering aspects such as the availability of equipment, size of product and the location of jobsite
C-9.02.04	coordinate assembly in conjunction with others such as co-workers and other trades

Sub-task

C-9.03 **Assembles sub-components and components.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-9.03.01	select and use tools and equipment such as impact and torque wrenches based on type of assembly and space limitations for assembly
C-9.03.02	attach sub-components and components using processes such as bolting and welding
C-9.03.03	verify component is torqued to meet manufacturers' specifications
C-9.03.04	verify component placement according to drawings

Sub-task

C-9.04 **Sets fabricated component in place.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-9.04.01	inspect and verify location of installation according to erection drawings
C-9.04.02	plan for possible installation difficulties such as access to the area and equipment available, and adapt to shifting worksite needs
C-9.04.03	secure work area to ensure area is clear of personnel and obstructions
C-9.04.04	fit, place and adjust ensuring component is level, plumb and orientated according to drawings

Sub-task

C-9.05 **Fastens components on-site.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-9.05.01	determine the fastening method from the drawings such as bolting and welding
C-9.05.02	select and use tools and equipment such as wrenches, impact wrenches and torque wrenches
C-9.05.03	attach components together according to procedures and manufacturers' specifications

Task 10 Performs welding activities.

Context

Depending on the work environment and jurisdictional regulations, metal fabricators (fitters) may tack and then pass the weldment on to welders, or see the welding process through to its completion.

Required Knowledge

K 1	pre and post weld heat requirements
K 2	types of metals and their characteristics such as ductility and grade
K 3	indicators of temperature such as colour of heated materials
K 4	hazards such as fire and toxic fumes associated with welding processes
K 5	drawings and specifications such as weld symbols
K 6	jurisdictional rules and certification requirements for tacking and welding
K 7	types, sequence and sizes of tacks
K 8	welding processes such as shielded metal arc welding (SMAW), flux cored arc welding (FCAW), gas metal arc welding (GMAW), gas tungsten arc welding (GTAW) and metal cored arc welding (MCAW)
K 9	causes and effects of welding distortions such as transverse and longitudinal
K 10	common defects in a tack such as cracks, porosity and slag inclusions
K 11	joint design and material preparation
K 12	weld sizes
K 13	back stepping and weld sequence
K 14	power sources
K 15	gas cylinder safety
K 16	characteristics of shielding gases
K 17	electrodes, wires and their characteristics
K 18	filler metal transfer modes
K 19	amperage (wire feed speed) and voltage (wire stick out) characteristics
K 20	troubleshooting techniques
K 21	mechanical forces required for correction

Sub-task

C-10.01 Applies heat prior to tack welding.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-10.01.01	determine pre-heat temperature of component material according to worksite welding procedures
C-10.01.02	select and use temperature measuring tools such as temperature sticks and digital heat sensors to stay within welding parameters
C-10.01.03	select and use equipment for pre-heating such as rosebuds, tiger torches, and induction heaters according to specifications
C-10.01.04	measure temperature of heated materials to prevent distortion and cracking

Sub-task

C-10.02 Performs tack welding.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-10.02.01	select and use welding tools and equipment such as GMAW and SMAW according to the materials and workplace procedures
C-10.02.02	protect near-by components from damage such as sparks and burn marks by applying protection such as metal plates and heat blankets
C-10.02.03	determine position and size, and apply tacks according to component being tacked
C-10.02.04	remove defective tacks using tools such as chisels, grinders and gougers without damaging the base metal

Sub-task

C-10.03 Minimizes welding distortions.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-10.03.01	estimate possible distortion to stay within allowances by discussing with others such as engineers, supervisors and co-workers
C-10.03.02	select and use restraints such as strong backs, clamps, braces and jigs to counteract the distortion
C-10.03.03	determine sequence of welding to minimize warping, pulling and cracking
C-10.03.04	limit distortion and stress in the component by applying stress removal methods such as peening, cooling and heating

Sub-task

C-10.04 Applies welding processes.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	no	yes	ND	ND	ND

Key Competencies

C-10.04.01	select, set-up and use welding equipment such as GMAW, SMAW and GTAW according to workplace welding procedures and jurisdictional requirements
C-10.04.02	select and use filler metals such as wire and electrodes according to specifications of base material
C-10.04.03	select and use ventilation equipment such as fume extractors, suction lines and respirators to prevent the inhalation of particles and fumes
C-10.04.04	weld to required size according to specifications such as number of passes and weld profile
C-10.04.05	adjust amperage, voltage and gas flow rates to achieve the desired weld profile
C-10.04.06	manipulate welding processes to achieve weld profile according to welding details

C-10.04.07	remove slag and spatter with equipment such as chipping hammers, grinders and wire brushes to make weld visible for inspection
C-10.04.08	repair welding defects such as porosity, undercut and crater cracks using tools such as grinders and gougers

Sub-task

C-10.05 Corrects welding distortions.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-10.05.01	measure the amount of distortion using equipment such as plumb bobs, straight edges and levels to determine if it is within tolerance
C-10.05.02	rectify distortions using methods such as mechanical and thermal methods according to specifications
C-10.05.03	select and use tools and equipment such as come-alongs, hydraulic rams and torches

Task 11 Completes project.

Context

This is the final stage of the process, where metal fabricators (fitters) put their last touches on the product. It includes refining the product to ensure that it meets the product's specifications and customer's requirements.

Required Knowledge

K 1	final product requirements
K 2	finishing processes such as painting, galvanizing and pickling
K 3	types of finishes on bare metal such as polished, brushed and mill
K 4	tagging procedures

Sub-task

C-11.01 **Determine finishing process.**

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-11.01.01 identify finishing process such as internal coatings, galvanizing and painting according to drawings

C-11.01.02 identify areas not to be finished

Sub-task

C-11.02 Prepares material for finishing.

NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU
yes	yes	yes	yes	NV	yes	NV	yes	yes	yes	ND	ND	ND

Key Competencies

C-11.02.01 select and use tools and equipment such as buffing wheels, sanders and grinders to remove burrs, sharp edges, weld spatter and slag so that finishing materials will adhere to components

C-11.02.02 ensure that welds are profiled according to specifications

C-11.02.03 sort assemblies for specific finishes to prevent cross-contamination

C-11.02.04 fill and blend surface blemishes such as plate clamp gouges, arc strikes and defects using welding processes

C-11.02.05 install tagging system to ensure traceability after finishing process such as blasting and painting

C-11.02.06 prepare weldments for galvanizing by providing air bleeds and drain holes

APPENDICES

APPENDIX A — TOOLS AND EQUIPMENT

Hand Tools

ball peen hammer
bar clamps
c-clamps
chisels
dogs and wedges
drift pins
drill bit kit
files
locking pliers
marking devices
plumb bob
screwdrivers
sledge hammer
tap and dies
toggle clamps
torque wrench
weldering magnets
wrenches (spanner, allan, pipe)

Power Tools

angle grinder
belt sander
bevelling machine
concrete drills
die grinders (electric and pneumatic)
drills (electric and pneumatic)
hammer drill
hydraulic portable punch
impact tool
hydraulic rams
magnetic drill
metal cutting saw with carbide blade
nibblers
pneumatic needle guns
pneumatic riveter
powder-actuated tools
reamer drill (electric and pneumatic)

Stationary Machinery, Cutting Equipment, Forming Equipment and Accessories

angle master
angle shear
band saw
beam line
bench grinder
bench vice
bevellers
brake press
CNC punches
cold saw
dies
drill press
drill press vice
dry cutter saw
forge
friction saw
hold down clamps
ironworker
mandrel bender
manual pipe bender
oxy-fuel cutting equipment
pipe cutters and threaders
plasma cutting equipment
plate rollers
power hack saw
radial arm drill
shape/manual die bender
shape roller
shears (mechanical, electric and hydraulic)
stationary belt sander

Welding Equipment

carbon air arc gouger
chipping hammer
fillet gauges
gas tungsten arc welding (GTAW) equipment
ground clamps
heating equipment (rosebuds, tiger torch, induction heaters)
MIG pliers
shielded metal arc welding (SMAW) equipment
submerged arc welding
welding cables
wire brush
wire feed welding equipment
[flux core welding (FCAW) and gas metal arc welding (GMAW)]

Layout and Measuring Equipment

beam board
beam gauge
bevel square
centre finder
chalk line
combination square
digital heat sensor
dividers
levels (torpedo, 2, 4 foot)
measuring tape
micrometers
paint marker
piano wire and string line
plumb bob
protractor
punches (center, prick, drift, transfer)
ruler
scientific calculator
scribe
small clamps
soapstone
stair gauges
steel square (2 foot)
steel thickness gauge
straight edge
temperature stick
templates
trammel points
transits
vernier calipers

Rigging, Hoisting and Lifting Equipment and Material Handling Equipment

beam clamps
blocks
bridge crane
carts
chain falls
chain slings
come-alongs
conveyor roller
dollies
forklift
grip hoist (TirforTM)
load indicators
plate clamps
plate hooks
pneumatic lift
power rollers
ropes
shackles
spreader bars
suction cups
synthetic slings
tag line rope

hydraulic and manual jacks
jib crane
lifting magnets
tuggers
turnbuckles
wire rope slings

Access Equipment/Équipement d'accès

ladders
man lifts
personnel basket
scaffolding
scissor lifts

Personal Protective Equipment and Safety Equipment

air quality tester
cutting goggles
dust mask
eye wash station
face shields
fall protection equipment
fire extinguishers
fire resistant clothing
first aid kit
gloves
hard hats
hearing protection
reflective vest and coveralls
respirator
safety boots
safety glasses and goggles
self-contained breathing apparatus (SCBA)
welding helmets / shields

APPENDIX B GLOSSARY

Arc templates (sweep)	A template used for verifying the inside radius of material being rolled
back stepping	a welding sequence designed to minimize distortion by welding short distances, from a forward point back to the previous weld
base metal	the metal that is being welded
bender	equipment used to bend tube, pipe or rod; some types include mandrel benders, tube benders and manual benders
brake press	stationary equipment used to bend metal sheet or plate
Computer Numerical Control (CNC)	a control system in which numerical values corresponding to desired tool or control positions are generated by a computer/computer program
ductility	ability of a material (such as metal or asphalt cement) to undergo permanent deformation through elongation (reduction in cross sectional area) or bending at room temperature without fracturing; easily molded or shaped
ferrous	containing iron
filler metal	the metal that is added to the base metal through the welding process
galvanizing	a metallurgical process done to coat steel with another metal (usually zinc) to prevent corrosion
heat numbers	reference numbers applied to materials at time of manufacture; used for traceability
induction heater	type of heating equipment that generates heat by creating an electromagnetic field
ironworker	stationary equipment used to perform a number of tasks including plate and bar shearing, coping and mitering of structural shapes, punching, bending and notching operations
jig	a device used to position and hold parts for repetitive assemblies

quality assurance	system of verifications to ensure that manufactured items conform to standards and specifications
layout	the process of transferring lines, centres, and other informative markings from the blueprint
material allowance	total overall amount of material required to fabricate the part including any extra material required for the process
metallurgy	science of the chemistry and physical properties of metals
notching	a shearing process done to remove a small notch of material (usually with an ironworker)
oxy-fuel cutting	cutting that uses the flame of an oxy-fuel torch and high pressure stream of oxygen
piece marks	numbers and letters that identify a sub-component or a component used to locate the piece on the assembly
plasma cutting equipment	equipment used to cut ferrous and non-ferrous metals by superheated gas; the heat is generated by an electrical arc, turning the gas into plasma
plate roller	stationary equipment used to roll metal sheet plate into cylinders or curved sections
shape roller	stationary equipment used to roll metal shapes such as angle iron, tubing and channel
shears	stationary equipment used to cut metal sheet plate
slag	the residue produced when welding or cutting
softeners	material used to protect rigging equipment and components from damage caused by contact with each other
stretch-out	a length of a flat piece of metal prior to forming
tack weld	a small weld used to hold parts in position prior to final welding
template	a gauge or pattern used as a guide to replicate a piece being fabricated
tolerance	a permissible deviation from a specified dimension

traceability	part of a quality assurance system that keeps track of the origin of materials by heat numbers or parts numbers
quality assurance	system of verifications to ensure that manufactured items conform to standards and specifications
weldment	a welded assembly or an assembly in the process of being welded
weld distortion	change in the shape of the welded material that is being caused by the expansion and contraction of the metals due to the heat input from the welding process

APPENDIX C ACRONYMS

CAD	computer-assisted design
CNC	computer numerically controlled
FCAW	flux cored arc welding
GMAW	gas metal arc welding
GTAW	gas tungsten arc welding
MCAW	metal cored arc welding
MIG	metal inert gas
MSDS	Material Safety Data Sheets
NC	National Coarse
NF	National Fine
NPT	National Pipe Tapered
OH&S	Occupational Health and Safety
PPE	personal protective equipment
SCBA	self-contained breathing apparatus
SMAW	shielded metal arc welding
WHMIS	Workplace Hazardous Material Information Systems
WLL	working load limit

APPENDIX D — BLOCK AND TASK WEIGHTING

BLOCK A COMMON OCCUPATIONAL SKILLS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	25	22	30	20	NV	20	NV	25	25	25	ND	ND	ND	24%

Task 1 Performs safety-related functions.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	23	20	15	NV	10	NV	15	20	10	ND	ND	ND	17%

Task 2 Maintains and uses tools and equipment.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	21	25	15	NV	10	NV	10	16	20	ND	ND	ND	17%

Task 3 Organizes work.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	21	15	35	NV	40	NV	30	16	25	ND	ND	ND	25%

Task 4 Performs quality assurance throughout fabrication and assembly process.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	19	20	20	NV	20	NV	20	8	30	ND	ND	ND	20%

Task 5 Handles materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	20	16	20	15	NV	20	NV	25	40	15	ND	ND	ND	21%

BLOCK B FABRICATION OF COMPONENTS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	50	49	40	50	NV	30	NV	40	40	50	ND	ND	ND	44%

Task 6 Performs layout.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	40	45	50	40	NV	50	NV	45	38	50	ND	ND	ND	45%

Task 7 Cuts materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	26	30	40	NV	25	NV	30	37	25	ND	ND	ND	30%

Task 8 Forms materials.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	30	29	20	20	NV	25	NV	25	25	25	ND	ND	ND	25%

BLOCK C ASSEMBLY OF COMPONENTS

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	National Average
%	25	29	30	30	NV	50	NV	35	35	25	ND	ND	ND	32%

Task 9 Fits and fastens sub-components and components.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	50	41	40	60	NV	50	NV	50	58	70	ND	ND	ND	52%

Task 10 Performs welding activities.

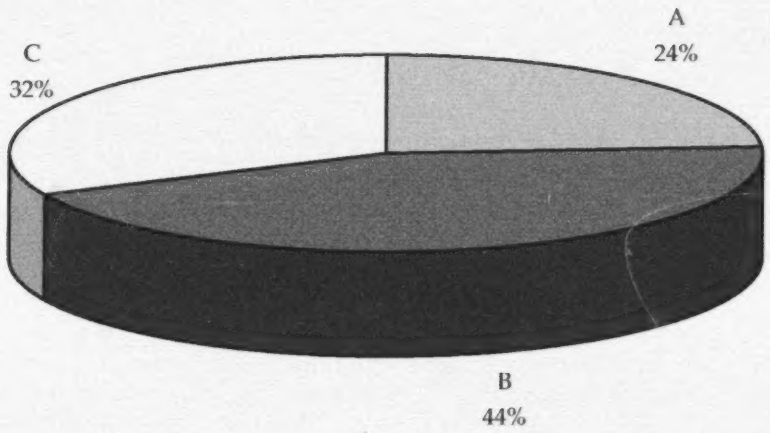
	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	40	35	35	NV	40	NV	30	28	20	ND	ND	ND	32%

Task 11 Completes project.

	NL	NS	PE	NB	QC	ON	MB	SK	AB	BC	NT	YT	NU	
%	25	19	25	5	NV	10	NV	20	14	10	ND	ND	ND	16%

APPENDIX E

PIE CHART*



TITLES OF BLOCKS

BLOCK A	Common Occupational Skills	BLOCK C	Assembly of components
BLOCK B	Fabrication of components		

*Average percentage of the total number of questions on an interprovincial examination, assigned to assess each block of the analysis, as derived from the collective input from workers within the occupation from all areas of Canada. Interprovincial examinations typically have from 100 to 150 multiple-choice questions.

APPENDIX F

TASK PROFILE CHART – Metal Fabricator (Fitter)

BLOCKS	TASKS	SUB-TASKS				
A – COMMON OCCUPATIONAL SKILLS	1. Performs safety-related functions.	1.01 Maintains safe work environment.	1.02 Uses personal protective equipment (PPE) and safety equipment.			
	2. Maintains and uses tools and equipment.	2.01 Maintains hand, power, layout and measuring tools and equipment.	2.02 Maintains stationary machinery.	2.03 Maintains cutting and welding equipment.	2.04 Uses access equipment.	
	3. Organizes work.	3.01 Interprets plans, drawings and specifications.	3.02 Communicates with others.	3.03 Organizes project tasks.		
	4. Performs quality assurance throughout fabrication and assembly process.	4.01 Performs visual inspections.	4.02 Verifies measurements, welds and layout.	4.03 Tracks material and parts for traceability.		
	5. Handles materials.	5.01 Organizes material.	5.02 Determines weights.	5.03 Applies rigging practices.	5.04 Operates material handling equipment.	
B – FABRICATION OF COMPONENTS	6. Performs layout.	6.01 Performs pattern development.	6.02 Calculates material allowances for various processes.	6.03 Determines dimensions.	6.04 Transfers dimensions.	6.05 Makes templates.
	7. Cuts materials.	7.01 Cuts material using manual plasma cutting equipment	7.02 Cuts material using manual oxy-fuel cutting equipment.	7.03 Cuts material using shears.	7.04 Cuts material using saws.	7.05 Cuts material using ironworkers.

BLOCKS	TASKS	SUB-TASKS				
		7.06 Cuts material using computer numerical controlled (CNC) equipment.	7.07 Drills holes.	7.08 Cuts threads.	7.09 Prepares joints.	
	8. Forms materials.	8.01 Forms materials using plate rollers.	8.02 Forms materials using shape rollers.	8.03 Forms materials using conventional and computer numerical controlled (CNC) press brakes	8.04 Forms materials using benders.	8.05 Applies heat for forming.
C – ASSEMBLY OF COMPONENTS	9. Fits and fastens sub-components and components.	9.01 Assembles jigs	9.02 Determines proper sequence for assembly.	9.03 Assembles sub-components and components.	9.04 Sets fabricated component in place.	9.05 Fastens components on-site.
	10. Performs welding activities.	10.01 Applies heat prior to tack welding.	10.02 Performs tack welding.	10.03 Minimizes welding distortions.	10.04 Applies welding processes.	10.05 Corrects welding distortions.
	11. Completes project.	11.01 Determines finishing process.	11.02 Prepares material for finishing.			